DIFFERENTIATION OF TYPHOID AND PARATYPHOID A AND B BACILLI BY A DEXTRIN-INOSITE MEDIUM

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Numerous cases of paratyphoid in the hospital made it necessary to use, beside the Russel double sugar agar, a second medium for differentiating between the typhoid bacillus and paratyphoid bacilli A and B. Since paratyphoid bacillus B ferments inosite with gas formation and paratyphoid bacillus A does not, the inosite medium of Weiss and Rice[1] was used. This made a second planting necessary, and it seemed a good plan, if possible, to get further confirmatory evidence as to whether the typhoid bacillus ferments dextrin and the paratyphoids do not, so a medium containing both carbohydrates was used.

The medium was an ordinary 3% infusion agar, with the usual typhoid reaction of about +0.7 acid. The agar was sterilized in the autoclave and if there was any change in reaction it was readjusted to +0.7 acid; 1% of both dextrin and inosite were added (other proportions were tried but did not give satisfactory results) and a sterile litmus solution (Grubler's) was added till a light violet color was obtained, and the medium tubed. The medium was given one sterilization (Arnold), as further heating tends to break up the carbohydrates, and slanted. The slants were incubated for 24 hours and any tubes discarded which showed growth. This should be the usual procedure for testing all mediums but is especially necessary in this case where such short sterilization was given.

The dextrin used was Merck's C.P. and the inosite was made in this laboratory according to Nelson.[2] Dextrin represents a heterogeneous group of gums varying in complexity from amylodextrin approaching starch in its reactions to achrodextrin. The dextrins which seem to be acted on by the typhoid bacillus must be erythrodextrin as every sample containing the lower dextrins gave results while the amylodextrin did not. The Merck preparation is a mixture of all of them. Erythrodextrin can be easily prepared by allowing saliva to act on soluble starch until the digestion mixture no longer gives a starch reaction. The dextrin is then thrown down by alcohol, dried and procured as a white powder.

The stools and urine were plated on brilliant green medium of Teague[3] or Endo plates and suspicious colonies fished and planted on Russel double sugar agar and dextrin inosite medium. With the dextrin-inosite medium the typhoid bacillus gave a violet slant with a red butt in about 12 hours and an extremely decolorized butt in 24 hours, while the paratyphoid bacillus B gave the same reaction with the additional formation of gas in the butt and the paratyphoid bacillus A did not react at all, merely giving a good growth on the slant.

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[1] Jour. Med. Research, 1917, 30, p. 403.
[2] Jour. Am. Chem. Soc., 1915, 37, p. 1552.
[3] Jour. Infect. Dis., 1916, 18, p. 1. Ibid., 1917, 21, p. 145.

The typhoid bacilli that were tried on the medium had mostly been cultivated on artificial mediums for some time and seemed to have lost some of their powers of fermentation, but after cultivation through broth they regained them. This condition did not arise in those cases in which the organisms were freshly isolated from urine or stools. Of the strains tried, all 23 eventually produced a good growth on the slant and acid in the butt of the tube, with the final reduction of the litmus.

The 9 strains of the paratyphoid bacillus B that were used in this investigation all gave a violet slant with well marked growth and a decolorized butt with well marked gas formation.

All 8 of the strains of paratyphoid A used gave a good growth on the dextrin-inosite medium with neither gas nor acid formation.

Other members of the typhoid-colon-dysentery group were tried on this medium with the following results: B. dysenteriae, Shiga-Kruse type and Hiss-Russel type, gave no reaction, while Flexner and Rosen types gave acid formation.

B. coli communior gives acid and gas formation while B. coli gives no reaction. B. aerogenes gives acid and gas formation. B. murium and B. pullorum give no reaction, though Weiss and Rice report one group of B. typhi-murium as negative on inosite and another as positive.

All the strains tried were identified by the Gram stain and agglutination with specific serum in dilutions up to 1:1,000 both before and after planting

The dextrin-inosite medium differentiates between the typhoid bacillus and paratyphoid bacilli A and B, although it does not differentiate between the paratyphoids and the colon bacilli. In conjunction with Russel double sugar agar it gives confirmatory evidence of the identity of the typhoid bacillus and distinguishes between the paratyphoid bacilli A and B.

SUMMARY

The typhoid bacillus ferments dextrin-inosite with acid formation.

The paratyphoid bacillus B ferments dextrin-inosite medium with acid and gas formation.

The paratyphoid bacillus A does not ferment dextrin-inosite.

The dysentery group falls into two groups; the Shiga-Kruse and Hiss-Russel types do not ferment dextrin-inosite, while the Flexner-Rosen types do.

B. typhi murium and B. pullorum do not ferment dextrin-inosite.

B. aerogenes ferments dextrin-inosite with gas formation.